In the claims:

1. (Previously Amended) A non-destructive *in situ* method for directly monitoring an electronic device, comprising the steps of:

measuring at least one outgas or volatile organic compound of a material, a byproduct of the material, a reaction product of a constituent of the material, or a contaminant of a material of the electronic device, by means of a multisensor array comprising at least one solid-state gas sensor;

detecting more than one property of the outgas or volatile organic compound;

combining the detected properties to produce a signal output; and

processing the signal output with multivariate analysis to convert the signal output into information representative of a quality of the material.

2. (Previously Amended) A method according to claim 1 wherein the multivariate analysis comprises processing the signal output with a pattern recognition algorithm.

3. (Original) A method according to claim 2 wherein the multivariate analysis uses unsupervised statistical pattern recognition.

4. (Original) A method according to claim 2 wherein the multivariate analysis uses supervised statistical pattern recognition.

5. (Original) A method according to claim 1 wherein the analysis is at least one member selected from the group consisting of classical least squares (CLS), inverse least squares (ILS), partial least squares (PLS), principal components analysis (PCA), principle components regression (PCR), nonlinear principle components regression (NLPCR), nonlinear partial least squares (NLPLS), deterministic finite-state automata (DFA), Fast Look-up Algorithm for String Homology (FLASH), pattern recognition, and neural networks.

6. (Previously Amended) A method according to claim 1 wherein the processing step comprises sensory evaluation of the sample materials by human paneling to determine the quality of the material.

7. (Previously Amended) A method according to claim 1 wherein the step of measuring uses a near-field probe sensor which comprises a coated optical fiber.

8-9. (Cancelled)

10. (Previously Amended) A method according to claim 1 wherein at least one outgas or volatile organic compound is collected by a static or dynamic headspace technique in the measuring step.

11. (Previously Amended) A method according to claim 10, wherein heat, electromagnetic radiation, electricity, magnetism, or mechanical vibration assists in transferring the at least one outgas or volatile organic compound from the material.

12. (Previously Amended) A method according to claim 1 wherein at least one member of the group consisting of a semiconductor gas sensing device, a conductive polymer gas sensing device, a surface acoustic wave gas sensing device, a microbar sensing device, a micromechanical probe, a quartz crystal microbalance, and an optical sensor is used in the detecting step.

13. (Previously Amended) A method according to claim 1 wherein at least a metal oxide semiconductor gas sensing device is used in the detecting step.

14. (Cancelled)

15. (Previously Amended) A method according to claim 1, wherein the electronic device comprises a circuit board or a multichip module.

16. (Previously Amended) A method according to claim 1, wherein the outgas or volatile organic compound is at least one member of the group consisting of anions, organic acids, organics, and particulates.

17. (Cancelled)

18. (Original) A method according to claim 15 wherein the circuit board is in a soldering operation

19. (Original) A method according to claim 15 wherein the circuit board uses surface mount technology.

20-42. (Cancelled)

43. (Previously Amended) An apparatus for probing a quality of a material used in electronics or optics, comprising:

a multivariate detector having at least one solid-state gas sensing probe,

the multivariate detector capable of detecting at least one outgas or volatile organic compound from the material, a constituent of the material, a byproduct of the material, a reaction product of a constituent of the material, or a contaminant of the material;

transmission means for transmitting a signal between the multivariate detector and a data acquisition system, the data acquisition system capable of converting the signal into raw data;

a computational device capable of processing at least part of the raw data using multivariate analysis to create a data set; and

an output device capable of displaying, storing, or using the data set.

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